



# Vitreoretinal Complications and Outcomes in 92 Eyes Undergoing Surgery for Modified Osteo-Odonto-Keratoprosthesis

## A 10-Year Review

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**Purpose:** To analyze vitreoretinal (VR) complications and treatment outcomes in eyes undergoing modified osteo-odonto-keratoprosthesis (OOKP) surgery.

**Design:** Retrospective case series.

**Participants:** All patients who underwent modified OOKP (mOOKP) surgery at a tertiary eye-care center from March 2003 to February 2013 were included.

**Methods:** Medical records were reviewed for relevant medical history, best-corrected visual acuity (BCVA), slit-lamp examination, ultrasound scan, oral examination findings, and VR complications.

**Main Outcome Measures:** The BCVA at the last visit. Optimal anatomic outcome was attached retina with a normal intraocular pressure at the last visit.

**Results:** A total of 92 eyes of 90 patients were included. Indications for OOKP included Stevens–Johnson syndrome (n = 53), chemical injury (n = 36), and ocular cicatricial pemphigoid (n = 3). A total of 41 eyes of 39 patients developed VR complications, including vitritis (n = 21), retinal detachment (RD) (n = 12; primary RD = 5), retroprosthetic membrane (RPM) (n = 10; primary RPM = 2), endophthalmitis (n = 8), vitreous hemorrhage (VH) (n = 5; primary VH = 1), serous choroidal detachment (n = 5), hemorrhagic choroidal detachment (n = 2), and leak-related hypotony (n = 1). Mean interval from mOOKP surgery to occurrence of VR complication(s) was 43.8 months (median, 41.9 months; range, 0.2–95.5 months). After treatment of VR complication, visual improvement was seen in 17 eyes (42%) (mean improvement = 1.2 logarithm of the minimum angle of resolution [logMAR]; median, 0.8 logMAR; range, 0.1–2.5 logMAR), visual decline in 7 eyes (14%) (mean decline in BCVA = 0.6 logMAR; median, 0.4 logMAR; range, 0.3–1.8 logMAR), and no change in BCVA in 17 eyes (42%). However, BCVA  $\geq$ 6/60 was retained in 19 eyes and  $\geq$ 6/18 was retained in 9 eyes after final VR treatment.

**Conclusions:** Vitreoretinal complications constitute a significant cause of visual morbidity in eyes undergoing mOOKP surgery and pose a challenging situation to manage. However, appropriate and timely intervention can achieve encouraging results. *Ophthalmology* 2017;■:1–10 © 2017 by the American Academy of Ophthalmology

Modified osteo-odonto-keratoprosthesis (mOOKP) surgery is performed in eyes with ocular surface disease in which conventional penetrating keratoplasty is contraindicated or has a high risk of failure. It involves placement of an optical polymethyl methacrylate cylinder surrounded by the osteo-odonto alveolar lamina and covered by the buccal mucous membrane, which replaces the diseased cornea.<sup>1</sup> Long-term retention of the osteo-odonto-keratoprosthesis (OOKP) has been encouraging with good anatomic and functional outcomes. Recently, there have been concerns regarding resorption of the lamina in mOOKP eyes, especially in patients with Stevens–Johnson Syndrome (SJS).<sup>1</sup> Similar to the graft carrier melt in Boston Type 1 keratoprosthesis, lamellar resorption refers to the gradual degradation of the dental lamina leading to instability of the optical cylinder with an associated aqueous leak, and in extreme cases an

extrusion of the cylinder. This in turn can lead to posterior segment complications, including sterile vitritis associated with the early grades of resorption and retinal detachment (RD), choroidal detachment (CD), or endophthalmitis in advanced cases because of a breach in the protective epithelial seal.

Although mOOKP surgery has reasonably good outcomes, it is also associated with several complications. Vitreoretinal (VR) complications after mOOKP surgery have been reported in 23% to 56% of patients.<sup>2,3</sup> A PubMed search (August 1, 2017) using keywords (Vitreoretina), (Complications), and (Osteo-odonto keratoprosthesis) revealed 4 relevant studies. We present our experience of VR complications in 41 of 92 eyes (45%) undergoing OOKP surgery in a single center over the last decade.

## Methods

Medical records of all patients who underwent OOKP surgery from March 2003 to February 2013 were retrospectively reviewed for VR complications. Prior institutional review board approval was obtained for the study. This study adhered to the tenets of the Declaration of Helsinki. Patient records were analyzed for causes of reduced visual acuity, current best-corrected visual acuity (BCVA), clinical features, digital tonometry, and posterior pole evaluation, and ultrasound findings were analyzed for each follow-up visit.

The mOOKP procedure was performed in 3 stages: stage 1A, 1B, and 1C, and stage 2. This has been described in detail by Iyer and colleagues.<sup>3</sup> Modified OOKP stage 1A involves preparing the eye by performing iridodialysis, intracapsular cataract extraction, and anterior vitrectomy. Intraoperatively, the fundus is evaluated to assess the retinal and disc status to gauge the visual prognosis. Stages 1B and 1C are performed 1 month later, which involve harvesting the canine tooth and fashioning the osteo-odonto alveolar lamina and placing it in the contralateral subcutaneous cheek along with a buccal mucous membrane graft draped over the ocular surface. The final stage involves placement of the lamina in the eye beneath the mucosa. In an earlier report from our center, we reviewed a part of this patient cohort.<sup>3</sup> However, the current study includes more patients with a longer follow-up.

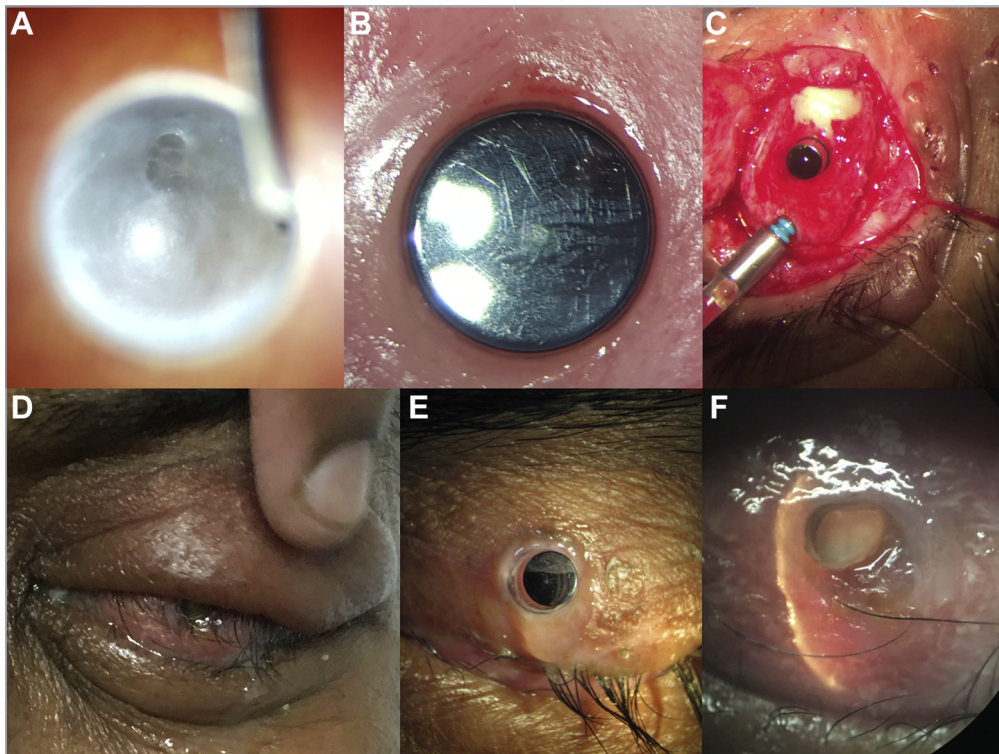
Ultrasound scan and optic disc photography with nonmydriatic camera were done at periodic intervals. Sterile vitritis was defined as an inflammatory reaction of the vitreous cavity that may be associated with sudden, painless decrease in vision accompanied with vitreous cells and membranes, with an attached retina (fundus exam or B-scan), and complete resolution after empirical systemic

steroid and antibiotic therapy. The medical and surgical details of management of these eyes were analyzed. SPSS-14 software (SPSS Inc., Chicago, IL) was used to analyze the data. Paired Student *t* test was used to compare the quantitative data. For comparison between more than 2 groups, the Kruskal–Wallis test was used. A *P* value <0.05 was considered significant.

## Results

The indications for mOOKP surgery in 92 eyes (90 patients) were SJS (53 eyes), chemical injury (36 eyes), and ocular cicatricial pemphigoid (3 eyes). Mean age at presentation of patients for mOOKP surgery was 30 years (median, 29 years; range, 19–53 years). Mean follow-up was 73 months (median, 72.5 months; standard deviation, 36.8 months; range, 6.4–135.1 months). Vitreoretinal complications developed in 41 eyes (45%) of 39 patients (Fig 1), of whom 25 were male and 14 were female. Of the 41 eyes, 8 eyes developed VR complications within 1 year of surgery, 5 eyes developed complications in the second year after surgery, 4 eyes developed complications in the third year after surgery, and 5 eyes developed VR complications in the fourth year after mOOKP surgery for the first time. It was noted that 19 eyes developed their first VR complication during the fifth year or later after mOOKP surgery. Indications for mOOKP surgery in eyes that developed VR complications included SJS (*n* = 27), chemical injury (*n* = 11), and ocular cicatricial pemphigoid (*n* = 3).

Posterior segment complications noted after mOOKP were categorized on the basis of the primary underlying cause and analyzed for being associated with lamellar resorption or not. Some



**Figure 1.** Complications associated with osteo-odonto-keratoprosthesis (OOKP) surgery include retroprosthetic membrane (A), periostic aqueous leak (B), lamina resorption (C), panophthalmitis (D), periostic aqueous leak in an eye with through-the-lid OOKP (E), and endophthalmitis in an eye with through-the-lid OOKP with lamina resorption (F).

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